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Use of census data and city housing reports in creating housing-unit demolition rates

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The Forecasting Division of the Office of Financial Management has been conducting research regarding small-area population estimates. A major basis for creating such estimates is the housing stock for such areas. The housing stock can increase, mostly via new construction, and housing units can be lost due to demolition, destruction or removal.

Where no such data are regularly collected locally, it becomes necessary to estimate housing stock losses. This report investigates census data as a possible source for creating rates of such losses.

Housing cohort data from censuses

The U.S. Census Bureau has included a question on "year structure built" for housing stock since at least the 1960 census. In theory, it should be possible to compare the number of units in various construction cohorts from census to census to yield rates of intercensal housing stock wastage or loss. This report briefly evaluates how well that concept might be applied in a Washington state setting.

"Year structure built" data have been tabulated by the Bureau so that it is possible to show the number of housing units built before 1940 (in aggregate) and for each decade starting in 1940 up to the time of each given census. The tabulations incorporating the decade immediately before the census in question actually continue for the three months leading up to the April 1st census benchmark date. For example, for the 1980 census, the closest that a user can approximate the period inclusive of 1970-79 is the period from January 1st 1970 through March 31st 1980 – 2.5 percent more time than in a true decade.

The data are usually tabulated as total units and as units by tenure status (owner-occupied and renter-occupied). There are no published tabulations of units by structure type.

Since the data are based on the response of the occupant, there are no data for unoccupied housing units. However, the Census Bureau imputed the responses to the entire housing stock counted by the census, occupied or not. For instance, the Puget Sound area was feeling the impact of the "Boeing Bust" at the time of the 1970 census, and higher than normal vacancy rates were reported in the data. The (unanswerable) question is: were occupied units evenly scattered by housing cohort or were some cohorts disproportionately over- or under-represented by respondents?

A further potential problem is that the "year structure built" question is a sample – not complete-count – item, so error can enter through sampling variation from census to census.

Perhaps the most serious potential source of error is respondent ignorance as to when the structure he lives in was built. It is likely that renters are less likely to know this information than owners. And there is the possibility that accuracy might have deteriorated when the census moved from being taken by trained canvassers to self-enumeration.

Analysis

Table 1 presents decade-by-decade housing cohort change ratios derived from census 19630-2000, inclusive. The geographical units reported are: Washington state, King County, Seattle, King County balance (the county less Seattle), Pierce County, Tacoma, Pierce County balance, Spokane County, Spokane and the Spokane County balance. There were some city annexations during the period shown, but these were comparatively minor in terms of the number of housing units involved. In any case, the statewide and countywide data were not affected by annexations.

Table 1: Census-to-census comparisons of housing stock by reported year of construction

	Census-to-census ratios			Census-to-census ratios			Census-to-census ratios		
Year built	1980 / 1970	1990 / 1980	2000 / 1990	1980 / 1970	1990 / 1980	2000 / 1990	1980 / 1970	1990 / 1980	2000 / 1990
Washington									
Pre-1940	0.829	0.909	0.962						
1940-49	1.053	0.89	0.926						
1950-59	1.025	0.996	0.992						
1969-69	0.928	0.985	0.971						
1970-79		0.948	0.992						
1980-89			0.848						
King County				**Seattle**			**King County balance**		
Pre-1940	0.873	0.956	0.987	0.878	0.973	0.973	0.853	0.884	1.051
1940-49	0.999	0.898	0.928	0.999	0.887	0.918	0.999	0.915	0.945
1950-59	0.993	0.968	1.001	1.013	0.945	1.024	0.977	0.988	0.983
1969-69	0.909	0.949	0.969	0.932	0.982	1.005	0.901	0.936	0.956
1970-79		1.001	0.967		0.98	1.192		1.006	0.921
1980-89			0.836			0.821			0.839
Pierce County				**Tacoma**			**Pierce County balance**		
Pre-1940	0.874	0.914	0.997	0.864	0.929	1.002	0.893	0.888	0.987
1940-49	1.006	0.906	0.905	1.001	0.924	0.924	1.011	0.887	0.885
1950-59	0.996	0.981	0.98	1.089	0.988	1.007	0.95	0.978	0.964
1969-69	0.9	0.979	0.955	0.94	1.054	0.866	0.887	0.951	0.991
1970-79		0.911	0.991		0.89	1.049		0.917	0.976
1980-89			0.853			0.887			0.845
Spokane County				**Spokane**			**Spokane County balance**		
Pre-1940	0.84	0.873	0.995	0.831	0.902	0.988	0.874	0.767	1.025
1940-49	1.125	0.905	0.957	1.219	0.891	0.993	0.961	0.936	0.879
1950-59	1.048	1.054	0.95	1.055	1.086	0.994	1.038	1.011	0.886
1969-69	0.983	1.01	1.014	1.068	1.008	1.159	0.934	1.011	0.918
1970-79		0.909	0.975		0.924	0.962		0.902	0.981
1980-89			0.886			0.872			0.894

NOTE: period closest to census includes Jan-Mar of census year.

The table presents intercensal housing cohort change ratios that, in principle, should indicate loss due to demolition or removal. Unfortunately, the ratios do not conform to expectations.

Consider the data for Seattle. The 1980/1970 ratio for the 1950-59 cohort is greater than one, indicating (a) an increase in the number of units, or (b) misreporting of the age of housing units. Clearly the likely factor is misreporting, because the first alternative is impossible for practical purposes: the only way for additional housing from 1950-59 to appear is through being hauled in from elsewhere, an unlikely event where a large number of units would be involved. Other unexpected data values that might be attributed to misreporting are the two other cases of ratios larger than one and the1970-79 cohort ratio of 0.836 for the 1990-2000 decade (similar low ratios are found for Pierce and Spokane counties as well as for the state as a whole).

Otherwise, there seem to be no consistent patterns for cohorts across time or for cohorts within a single decade observation. One might naively expect that older cohorts would suffer higher loss rates than those for newer housing, but the data do not confirm this.

Table 2 offers a rough comparison of housing losses implied by census data and losses reported by Seattle, Tacoma and Spokane to Washington State. The census data groupings can be explained by examining the Seattle bloc. The pre-1970 housing cohort is represented twice: first is the total housing reported in the "year structure built" question response for the 1970 census, the second is the pre-1970 housing in the 1980 census tabulation (keep in mind that the first number is slightly inflated because January-March 1970 housing is included). In Table 2, the cohort units from the later census are subtracted from the cohort units from the earlier census. These differences are reported in the second column from the right. The right-hand column contains the city-reported demolitions between April of 1970 and the end of March 1980 expressed as a negative number. The census-based loss is 14,892 and the reported loss is 10,438.

Table 2: Comparison of census change in historical (pre-decade) housing stock and reported demolitions: selected cities

Area and year built	Census: 1970	1980	1990	2000	Change (census)	Demolitions (reported)
Seattle						
Pre-1970	221,910	207,018			-14,892	-10,438
Pre-1980		229,922	219,492		-10,430	-4,213
Pre-1990			249,032	243,657	-5,375	-3,109
Tacoma						
Pre-1970	58,609	54,897			-3,712	-2,025
Pre-1980		67,705	64,145		-3,560	-1,035
Pre-1990			75,147	72,399	-2,748	-688
Spokane						
Pre-1970	64,321	61,864			-2,457	-2,461
Pre-1980		76,023	72,079		-3,944	-1,233
Pre-1990			79,875	78,932	-943	-523

NOTE: Demolitions are totals and can include post-censal new construction.

Aside from the pre-1970 Spokane cohort, which had essentially tied results, the reported losses are less than census-derived losses. In some cases, the results are dramatically different – see pre-1980 and pre-1990 for Tacoma and pre-1980 for Spokane, where reported losses were well less than half the census-derived losses.

Table 3 presents single-year housing loss rates calculated from city data and total housing units reported in various censuses. Since demolition numbers can jump around from year to year, data for the census year and the two succeeding years were averaged to yield a one-year demolition count. The housing data are for total housing units at the time of the census as reported in the Office of Financial Management publication *Population Trends* (various issues).

Table 3: Demolitions immediately following censuses as reported by selected cities

City and census	Housing stock	Demolitions (3-year*)	Annual average	Percent demolished
Seattle				
1970	221,973	2,128	709	0.32
1980	229,922	no data	NA	NA
1990	249,032	960	320	0.13
2000	270,524	1,267	422	0.16
Tacoma				
1970	58,697	704	235	0.4
1980	67,705	339	113	0.17
1990	75,147	227	76	0.1
2000	81,102	383	128	0.16
Spokane				
1970	64,338	1,054	351	0.55
1980	76,023	530	177	0.23
1990	79,851	198	66	0.08
2000	87,941	93	31	0.04

NOTE: Demolitions are for the three years following a census: for example Apr. 1990 - Mar. 1993.

Housing loss rates were highest around 1970 for all three cities and then fell for the following data points (there were no demolition reports from Seattle in the early 1980s, however). Spokane had quite low rates in 2000. Otherwise, annual loss rates were around 0.15 percent, give or take 0.08 percent. In the "real world", such rates are affected by such factors as natural disasters, housing market conditions, and urban renewal initiatives.

Conclusions

Thanks to many census respondents' ignorance regarding "year structure built", census-based housing cohort loss data are not reliable either for benchmarking housing stock by age or for creating loss rates by age of unit.

For the purposes of estimating losses for county of municipal sub-areas, it seems better to use or adapt rates based on city demolition reports.